ODORATOR®

User's Manual
Natural Gas (Methane)

HEATH CONSULTANTS

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ODORATOR®

User's Manual

Natural Gas (Methane)

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Heath....Safety, Leadership, Innovation, Performance
Then, Now and Tomorrow

INTRODUCTION

Natural gas (methane) to be tested enters the ODORATOR through the barbed fitting at the gas supply inlet port. Internally, the gas passes through an internal five micron filter to the input of a low pressure regulator. It then passes from the output of the low pressure regulator to the flow metering valve. This valve, located on the top panel of the ODORATOR, is operated by the user. After passing through the valve (when opened), the gas enters the mass flow sensor. This is the heart of the ODORATOR. The mass flow sensor responds to gas flow within the range of the flow metering valve.

The signal from the mass flow sensor is then processed, converted to a digital signal and fed to a liquid crystal display (LCD). The gas from the mass flow sensor then passes to the mixing chamber where it is combined with air drawn in by a blower wheel. The user then sniffs the gas / air mixture at the exhaust port. The flow metering valve is incrementally opened and the exhaust port sniffed until odorant is readily detectable at which time the user presses and holds the READ switch down to display percent gas in air by volume.

The electronics and the speed of the blower wheel are calibrated so that the concentration of the methane gas / air sample at the exhaust port agrees with the LCD at the 20% Lower Explosive Level (L.E.L.) which is 1.00 % gas. All other readings may be corrected using the correction chart. The correction chart is included to linearize the instrument within its range. To use the chart, record both the ODORATOR readily detectable level reading and the corrected actual value. For ODORATOR readings not specified in the chart, linearly interpolate between the next highest and lowest points on the chart. Do not extrapolate beyond the readings in the chart. Depending on how much the flow metering valve is opened, the concentration of gas in air at the exhaust port will be anywhere from zero to approximately 2%. The LCD can only indicate up to 1.99%. Concentrations above 1.99% will be indicated by the LCD having its last two digits dashed out as “1.--”.

When the ODORATOR is turned on, the user might momentarily notice the letter “L” on the LCD when the READ switch is depressed and held down. If the “L” fails to disappear, it may be an indication of blower speed. The “L” indicates a speed problem, and if on, the Odorator should not be used.

When it is time to replace the batteries, “LO BATT” will be indicated in the upper left corner of the LCD when the READ switch is depressed and held down.

The ODORATOR is designed and intended to be used in accordance with the GPTC Guide For Gas Transmission And Distribution Piping Systems, (49 CFR) 192.625 Subpart L, dated 10-15-03 and the American Society For Testing And Materials Standard D 6273 - 08. Supply gas must be natural gas (methane) of high quality. Blended or mixed gases as sometimes found during peak shaving cannot be tested using the ODORATOR.

WARNINGS AND CAUTION

PRIOR TO USE, OPERATOR SHOULD READ ALL PRECAUTIONS, INSTRUCTIONS FOR OPERATION, AND MAINTENANCE REQUIREMENTS CONTAINED IN PRODUCT MANUAL.

NOTE: DO NOT USE THE ODORATOR OR BREATHE IN GAS FROM SOURCES WHICH MAY CONTAIN TOXIC LEVELS OF CHEMICALS, SUCH AS HYDROGEN SULFIDE (H_2S), AS IT COULD BE HARMFUL TO HUMAN HEALTH AND SAFETY TO DO SO. SOURCES WHICH MAY CONTAIN TOXIC LEVELS OF CHEMICALS INCLUDE, BUT ARE NOT LIMITED TO, PRODUCTION SYSTEMS AND LANDFILLS.

IT IS THE SOLE RESPONSIBILITY OF THE PRODUCT PURCHASER/ OWNER TO ENSURE THAT: (1) ALL OPERATORS AND/OR USERS OF THE ODORATOR READ, UNDERSTAND, AND COMPLY WITH THE PRECAUTIONS, INSTRUCTIONS FOR OPERATION, AND MAINTENANCE REQUIREMENTS CONTAINED IN THIS MANUAL; (2) THE ODORATOR IS ONLY USED IN A PROPER AND SAFE MANNER; AND (3) WHILE USING THE ODORATOR, OPERATORS ARE NOT INHALING OR SNIFFING DANGEROUS MATERIALS THAT COULD CAUSE INJURY OR DEATH.

HEATH WARRANTS ONLY THAT THE PARTS MANUFACTURED BY IT WILL BE AS SPECIFIED AND FREE OF DEFECTS. HEATH MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, AND ANY AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE ARE HEREBY DISCLAIMED."

DURING OPERATION, KEEP THE ODORATOR AWAY FROM OPEN FLAMES. INLET SUPPLY PRESSURE SHOULD NOT EXCEED FOUR PSIG. INLET PRESSURES IN EXCESS OF FOUR PSIG WOULD RUPTURE THE LOW PRESSURE REGULATOR DIAPHRAGM, VENT THE GAS OUT OF THE INSTRUMENT AND CAUSE AN INSTRUMENT FAILURE. THE RECOMMENDED INLET SUPPLY PRESSURE IS 7" WATER COLUMN.

WHEN OPERATING THE ODORATOR, YOU WILL BE WORKING WITH FLAMMABLE METHANE GAS WHICH IS POTENTIALLY DANGEROUS IF NOT HANDLED PROPERLY. METHANE GAS FROM A LECTURE BOTTLE MAY BE ODORLESS AND IS FLAMMABLE IN CONCENTRATIONS OF APPROXIMATELY 5.0 TO 15.0 PERCENT BY VOLUME IN AIR.

WHEN YOU ARE NOT OPERATING THE ODORATOR, CLOSE ALL VALVES AND TURN THE ODORATOR OFF.

ANY TIME GAS IS BEING PASSED THROUGH THE ODORATOR THE POWER SWITCH MUST BE TURNED ON. THIS WILL DILUTE THE GAS AT THE EXHAUST PORT AND PREVENT POCKETS OF CONCENTRATED GAS FROM ACCUMULATING.

100% L.E.L. IS APPROXIMATELY EQUAL TO 5% METHANE GAS BY VOLUME IN AIR. AS LONG AS THE REFERENCE C.G.I. READS SAFELY BELOW THE L.E.L., YOU SHOULD NOT HAVE ANY PROBLEM WITH A FLAMMABLE MIXTURE BUILDING UP.

ANY SUSPICION OF A GAS LEAK BY UNEXPLAINED SOUND OR OPERATION OF THE ODORATOR IS REASON TO IMMEDIATELY SHUT OFF THE GAS SUPPLY VALVES AND THEN SEEK THE CAUSE.

If indoors, do not turn the ODORATOR on until a reference C.G.I. indicates the environment is safe. Likewise, allow the ODORATOR to purge for at least one (1) minute after a reference C.G.I. also indicates the environment is safe. The ODORATOR is NOT DESIGNATED Intrinsically Safe and MUST NOT be used in a confined space or hazardous location.

WARNING:
KEEP THE ODORATOR AWAY FROM OPEN FLAMES, INLET PRESSURE SHOULD NEVER EXCEED 4 PSIG AND DO NOT OBSTRUCT OR BLOCK THE INTAKE OR EXHAUST PORT.

CAUTION: BECAUSE OF INHERENT LIMITATIONS, LIQUID CRYSTAL DISPLAYS SHOULD NOT BE SUBJECTED TO EXTREMES OF TEMPERATURE OR HUMIDITY. IF THE INSTRUMENT IS EXPOSED TO A TEMPERATURE BELOW FREEZING OR ABOVE +49 ^{O}C (+120 ^{O}F), THE LIQUID CRYSTAL DISPLAY MAY TEMPORARILY CEASE TO FUNCTION PROPERLY, AND IN SOME CASES PERMANENT DAMAGE MAY RESULT. IT IS THEREFORE RECOMMENDED THAT THE INSTRUMENT NOT BE SUBJECTED TO EXTREME CONDITIONS SUCH AS A CLOSED VEHICLE IN DIRECT SUNLIGHT OR CONTINUOUS SUB-FREEZING TEMPERATURES.

USE AT ELEVATION:
THE ODORATOR SHOULD BE USED WITHIN 1000 FEET OF ITS CALIBRATION ELEVATION FOR ACCURACY. A READING CORRECTION CHART, FOUND IN APPENDIX C, MAY BE USED FOR ELEVATION CHANGES GREATER THAN 1000 FEET.

TABLE OF CONTENTS

INTRODUCTION i
WARNINGS AND CAUTION iii
TABLE OF CONTENTS v

CHAPTER I

OPERATION

Instructions for Operation 1
A. Procedures 1
Figure 1 4

CHAPTER II

Periodic Test 5
Calibration 5

CHAPTER III

MAINTENANCE INFORMATION

Troubleshooting Chart 6
Parts List 7
Appendix A
Periodic Test Records 7
Appendix B
ODORATOR Natural Gas (Methane)
Reading Correction Chart 10
Appendix C
Use at Elevation 11

CHAPTER IV

SERVICE INFORMATION

Warranties and Warranty Repair.....17
Return Procedure 18
Customer Service, Manufacturing and Instrument Repair Locations 19

Chapter I

OPERATION:

This Chapter discusses the proper steps to safely operate the ODORATOR. Also included are procedures for periodic testing and identification of the ODORATOR's controls.

Operation of the ODORATOR

WARNING

DURING OPERATION, KEEP THE ODORATOR AWAY FROM OPEN FLAMES. INLET SUPPLY SHOULD NOT EXCEED 4 PSIG AND 1/4 PSIG (7 INCHES WATER COLUMN) IS RECOMMENDED.

****NOTE** Connect the ODORATOR to the gas supply with a non-absorbing, odor-free hose such as high grade urethane, PVC, or Tygon.**

****NOTE** Users of the ODORATOR should be selected with due consideration to smoking habits, colds, and other conditions of health, since these factors affect the sense of smell. It is desirable to select operators with an average sense of smell in order to obtain reasonably consistent results from the use of this instrument.**

****NOTE** See Figure 1 on page 4 for reference to the following steps.**

****NOTE** All valves must be closed and the Odorator turned "OFF".**

A. Odorization Readily Detectable Test Procedure:

1. Prior to attaching the sample hose, sniff the sample hose and verify no odorant is detected. If so, replace the sample hose.

2. Connect the sample hose to the gas supply outlet valve and to the ODORATOR inlet port (1).

3. Open the gas supply outlet valve and the ODORATOR flow metering valve for about 10 seconds to purge the air out of the sample hose.

4. Close the flow metering valve.

5. Turn the ODORATOR "ON". Raise the exhaust port cover.

6. Wait about 30 seconds and then position the nose about 3/4 inch (20 mm) above the exhaust port and sniff the exhaust. The exhaust must be un-odorized.

7. Push the read switch (5) and while holding it down adjust the zero knob (7) until the LCD reads ".00". Release the read switch.

8. Slowly open the flow metering valve counter-clockwise 1/2 - 1 turn. Wait about 30 seconds and then position the nose about 3/4 inch (20 mm) above the exhaust port and sniff the exhaust. Your upper lip may lightly touch the front edge of the exhaust port.

9. If no odorant is detected in the exhaust, repeat step 8.

****<u>NOTE</u>**** **The user should frequently pause when sniffing for odorant by moving the nose away from the instrument, breathing fresh air and then continuing testing. This precaution is necessary because the sense of smell fatigues rapidly during this type of test.**

10. The **first faint smell** of odorant is called the threshold detection level. Considerable variation will exist among individuals in detecting this threshold level.

11. Slowly open the flow metering valve another 1/2 - 1 turn, wait about 30 seconds and then position the nose about 3/4 inch (20 mm) above the exhaust port and sniff the exhaust.

12. If the exhaust does not have a readily detectable odor repeat step 11. If the exhaust does have a readily detectable odor, push and hold the read switch down and **record** the percent gas in air by volume reading as shown on the LCD. This reading is the **readily detectable level** which should be noticed by the average person's sense of smell.

13. Close the gas supply outlet valve, the flow metering valve and then disconnect the sample hose from the gas supply outlet.

14. Leave the ODORATOR "ON" for approximately one minute after the test to purge the mixing chamber.

15. Turn the ODORATOR "OFF".

16. If chosen, correct the reading value using the correction chart. The correction chart is included to linearize the instrument in its range. To use the chart, take the ODORATOR **readily detectable level reading** and **look up** and **record** the **corrected actual % gas value**. For ODORATOR readings not specified within the chart, linearly interpolate between the next highest and lowest points on the chart. Do not extrapolate beyond the readings in the chart. **The readily detectable level reading and, if chosen, the corrected actual value must meet the requirements of the user's company operations procedures.**

    Use at Elevation. See Appendix C, page 11.

ODORATOR

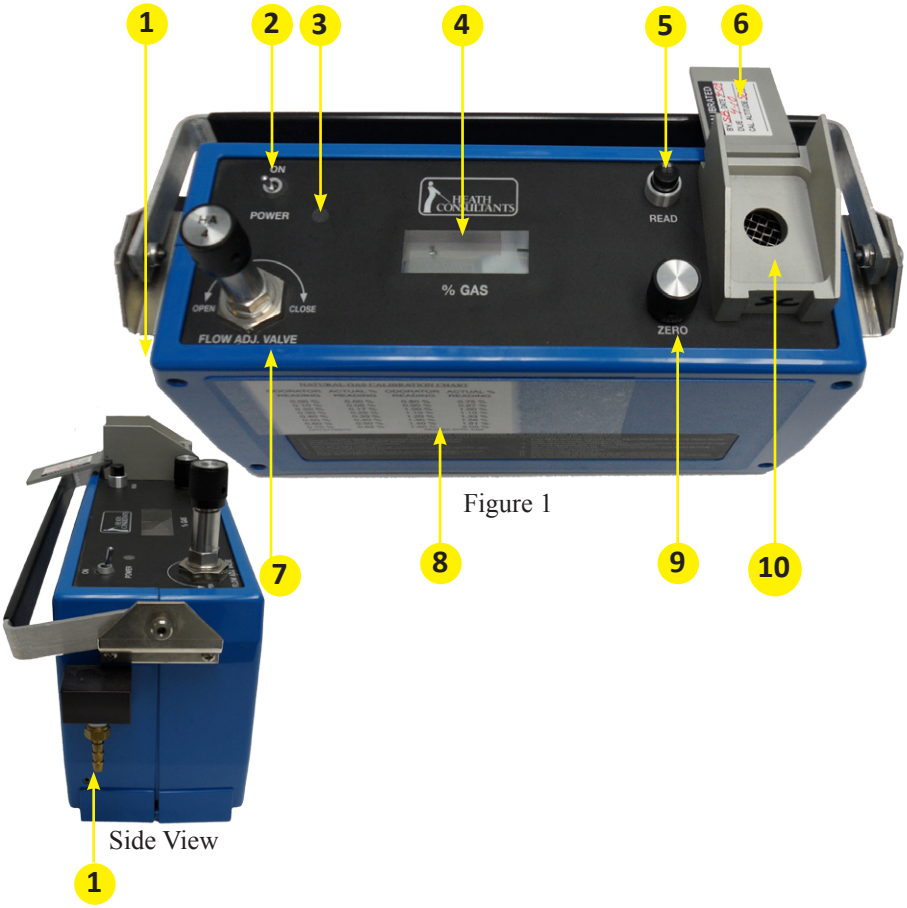

Figure 1

1. Gas Inlet
2. Power Switch
3. Power Indicator
4. LCD
5. Read Switch
6. Calibration Sticker
7. Flow Metering Valve
8. Correction Chart
9. Fine Zero Knob
10. Exhaust Port

Chapter II

Periodic Test:

1. Every thirty (30) days the ODORATOR should be operated with the power switch on and while **not** hooked up to a gas supply.
2. Wait about 30 seconds and then position the nose about 3/4 inch (20 mm) above the exhaust port and sniff the exhaust.
3. If no odor is detected, turn the ODORATOR "OFF". The ODORATOR has not absorbed the odorant and is usable.
4. If an odor is detected, turn the ODORATOR "OFF" and send it to the nearest Heath Repair Center (Regional Office) listed on page 19. The odor is an indication that the ODORATOR has absorbed the odorant and must have its internal tubing replaced and gas flow components cleaned.

   The forms on pages 8 and 9 are provided to document the Periodic Tests and are as a courtesy only. Company procedures will define how records are kept and in what format.

Calibration:

For regulatory compliance, instrument calibration and maintenance a factory calibration is recommended every 12-15 months from the date of the previous factory calibration. Only Heath factory or factory trained personnel should perform ODORATOR calibration. Factory recognized labels and seals maintain warranty.

Refer to page 19 for Heath repair and calibration centers.

Chapter III

MAINTENANCE:

Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	REMEDY
"LO BATT" appears on LCD.	Weak batteries.	Replace batteries.
Motor and LCD will not turn on.		RMA
Speed Indicator "L" comes on.		RMA
LCD will not zero with gas supply line attached to the ODORATOR.	Metering valve open or instrument problem.	Close metering valve or RMA.
Odorant always detected	Contaminated sample hose or flow system	Change tubing or RMA.

The RMA process may be found on page 18 of this manual.

Parts List

The following list specifies ODORATOR parts and accessories that are available from the factory or regional office.

0715630	Manual, ODORATOR User's, Methane
0715631	Correction Chart, Methane
0711517	Battery, Alkaline "C" size
22112110	Tubing (available in various lengths), Tygon
103607-0	Label, "Warning" Odorator
0716725	Regulator, External, Low Pressure, 250 PSI max.
0111004	Regulator, External, High Pressure, 3000 PSI max.
0716893	Overlay, Correction Chart

Appendix A

Periodic Test Records

The Periodic Test should be conducted every 30 days. The procedure for this test may be found on page 5 of this manual.

The forms on pages 8 and 9 are provided for your convenience. They should remain in the manual and be kept in a safe location as a permanent record of periodic testing. Company procedures will define how records are kept and in what format.

Periodic Test Record

Test Date	Results	Action	Operator Name

Appendix A

Periodic Test Record

Test Date	Results	Action	Operator Name

Appendix B

ODORATOR Correction Chart for Methane

This chart assumes the ODORATOR has been properly zeroed and allowed to run for at least one minute.

Methane Correction Chart, 1.00 % Reference

ODORATOR % Gas Reading	Actual % L.E.L.	Actual % Gas
.10	1.4	0.08
.20	3.4	0.17
.30	5.0	0.25
.40	6.6	0.33
.50	8.0	0.40
.60	10.0	0.50
.70	12.4	0.62
.80	15.0	0.75
.90	17.4	0.87
1.00 Ref.	20.0 Ref.	1.00 Ref.
1.10	22.0	1.10
1.20	26.6	1.33
1.30	31.2	1.56
1.40	37.2	1.81
1.50	41.0	2.05

Appendix C

ODORATOR Use at Elevation

The ODORATOR works by allowing a metered amount of sample gas to mix with a fixed amount of air and the mixture is then tested by a user for odorant detection. The internal components of the ODORATOR are very stable over changes in elevation. The air that is mixed, however, thins out with increasing elevation and must be accounted for. An elevation change of 3000 feet from the calibration can produce reading discrepancies of nearly 10 % which may be corrected. It is recommended that the ODORATOR readings be corrected whenever the elevation change from calibration is 1000 feet or more. The calibration elevation may be found on the exhaust port label.

A correction chart with accompanying usage directions has been developed. The chart provides corrections for both increased and decreased elevations. Most instruments will be used at elevations higher than their calibration elevation. ODORATORS calibrated at the factory have a calibration elevation of about 50 feet. Many gas utilities send their ODORATORS to the Heath factory for periodic calibration, hence most instruments will be used at elevations higher than their calibration elevation. ODORATORS calibrated at one elevation and then used at a higher elevation will make the most use of this chart. An ODORATOR calibrated and used within 1000 feet of the same elevation will use the respective correction chart found on the instrument.

The elevation correction chart is based on a normal atmosphere. Abnormal atmospheres, as caused by extreme weather conditions, can affect the measurements and safe use of the ODORATOR and operation is not recommended. Usage instructions are included with the chart but use the difference in elevation between the working or measurement elevation and the calibration elevation to select the respective correction value versus the ODORATOR'S reading.

****Note**** **The elevation correction chart supports new style Methane ODORATORS only. Instruments manufactured before July 1997, that have not been upgraded or calibrated to a methane reference other than 1.00% will not use the elevation correction charts. Consult the factory for using older style ODORATORS at elevation. To identify an ODORATOR'S style or to tell if an upgrade has been performed, check the top panel to see if there is a snap-in bezel or a clear window in the overlay covering the display ("LCD"). Older style ODORATORS have a snap-in bezel over the LCD. ODORATORS not calibrated for 1.00% methane have correction charts for that gas or reference level and can be identified by the chart as the reading and actual values will be equal at the reference level.**

Appendix C

Elevation Corrections for the Methane ODORATOR

The methane ODORATOR mixes air with natural gas to allow the user to determine the percent gas level at which odorant is readily detectable. As elevation is increased or decreased, the air density changes and must be accounted for. Use the Elevation Change Correction Chart as follows:

1. Use the ODORATOR to determine the readily detectable level per the instructions in this manual.
2. Write down the readily detectable reading from the LCD on the ODORATOR.
3. Write down the elevation at which the ODORATOR was last calibrated as found on the label on the inside of the exhaust port cover.
4. Determine the elevation at which the reading was taken.
5. Subtract the calibration elevation from the reading elevation and round off to the nearest 1000'.
6. Positive elevation differences correspond to the "UP" columns in the chart while negative elevation differences correspond to the "DOWN" columms. Determine which elevation change correction chart column to be used.
7. Use the ODORATOR reading and either look up the actual % gas value from the chosen column or interpolate the actual % gas value for the readings between the values on the chart and write the actual % gas value down.

Interpolation Example 1: UP Column

An ODORATOR reading of .23 is taken at 3000'. The calibration elevation is 50' so the elevation difference is 3000 - 50 = 2950, which is rounded off to 3000'. The difference is positive so the UP 3000 correction column will be used.

A reading of .23 lies between chart readings of .20 and .30. This reading also lies between actual values of .19 and .28 using the UP 3000 correction column.

The reading as a percentage between the adjacent chart readings can be used to determine the actual value using the same percentage between chart actuals.

The reading of .23 is 30% of the difference in the chart higher reading from the chart lower reading. The lower chart reading and actual will be used as the base or reference.

$$\frac{.23 - .20}{.30 - .20} = .3 \text{ or } 30\%$$

Therefore the actual value will be 30% of the difference in the chart higher actual from the chart lower actual. Again, the lower value will be the base or reference.

30% of (.28 - .19) = .3 x .09 = .027 which is rounded off to .03

Since the actual value base is .19, the actual value will be .19 + .03 = .22% gas.

Interpolation Example 2: DOWN Column

An ODORATOR reading of .23 is taken at 2700'. The calibration elevation is 5500' so the elevation difference is 2700-5500 = -2800 which is rounded of to -3000'. The difference is negative so the DOWN 3000 correction column will be used.

A reading of .23 lies between chart readings of .20 and .30. This reading also lies between actual values of .15 and .22 using the DOWN 3000 correction column.

The reading as a percentage between the adjacent chart readings can be used to determine the actual value using the same percentge between chart actuals.

The reading of .23 is 30% of the difference in the chart higher reading from the chart lower reading. The lower chart reading and actual will be used as the base or reference.

$$\frac{.23 - .20}{.30 - .20} = .3 \text{ or } 30\%$$

Therefore the actual value will be 30% of the difference in the chart higher actual from the chart lower actual. Again, the lower value will be the base or reference.

30% of (.22 - .15) = .3 x .07 = .021 which is rounded off to .02

Since the actual value base is .15, the actual value will be .15 + .02 = .17% gas.

Elevation Change Correction Chart

Down 5,000'	Down 4,000'	Down 3,000'	Down 2,000'	Down 1,000'	READING	ACTUAL	Up 1,000'	Up 2,000'	Up 3,000'	Up 4,000'	Up 5,000'	Up 6,000'	Up 7,000'	Up 8,000'	Up 9,000'	Up 10,000'
.06	.07	.07	.07	.08	.10	.08	.08	.09	.09	.09	.09	.10	.10	.10	.10	.11
.14	.14	.15	.16	.16	.20	.17	.18	.18	.19	.19	.20	.20	.21	.21	.22	.22
.20	.21	.22	.23	.24	.30	.25	.26	.27	.28	.28	.29	.30	.31	.31	.32	.33
.26	.28	.29	.30	.32	.40	.33	.34	.35	.36	.37	.39	.40	.41	.42	.42	.43
.32	.33	.35	.37	.38	.50	.40	.41	.43	.44	.45	.47	.48	.49	.50	.51	.53
.40	.42	.44	.46	.48	.60	.50	.52	.53	.55	.57	.59	.60	.62	.63	.64	.66
.49	.52	.54	.57	.59	.70	.62	.64	.66	.68	.70	.73	.74	.76	.78	.80	.81
.60	.63	.66	.69	.72	.80	.75	.78	.80	.83	.85	.88	.90	.92	.94	.96	.98
.69	.73	.76	.80	.83	.90	.87	.90	.93	.96	.99	1.02	1.04	1.07	1.09	1.12	1.14
.80	.84	.88	.92	.96	1.00	1.00	1.03	1.07	1.10	1.14	1.17	1.20	1.23	1.26	1.29	1.31

Instructions for correction on page 13

Chapter IV

SERVICE INFORMATION:

Warranties and Warranty Repair

All instruments and products manufactured by Heath Consultants Incorporated are warranted to be free from defects in material and workmanship for one (1) year from the date of shipment.

Furthermore, the warranty on authorized repairs in the Houston Factory Service Center (FSC) and other regions is ninety (90) days materials and thirty (30) days labor. This repair warranty does not extend any other applicable warranties.

Our warranty covers only failures due to defects in materials or workmanship which occur during normal use. It does not cover failure due to damage which occurs in shipment, unless due to improper packing, or failures which result from accident, misuse, abuse, neglect, mishandling, misapplication, alteration, modification, or service by anyone other than a Heath warranty repair location.

Batteries and damage from battery leakage and all expendable items such as filters and tubing are excluded from this warranty.

Heath's responsibility is expressly limited to repair or replacement of any defective part, provided the product is returned to an authorized warranty repair location, shipped prepaid, and adequately insured. Return shipping charges and insurance will be paid by Heath warranty expense.

We do not assume liability for indirect or consequential damage or loss of any nature in connection with the use of any Heath product. There are no other warranties expressed, implied, or written except as listed above.

SERVICE INFORMATION:

Return Procedure (RMA):

The following steps will expedite the repair of your instrument:

1. Contact Heath Factory Service at 800-432-8487 to request a repair form. The form is available on-line at www.heathus.com - InfoCenter - Repair Forms.
2. Package carefully, using the original shipping carton and cushions if available and return all components including the repair form.

   The repair form requests information such as complete shipping and billing addresses, instrument or product name, model number and serial numbers. Also included will be a brief description of the problem you are experiencing and the person and phone number to be contacted for additional information and approvals. An RMA number will be assigned to the return.

CORPORATE HEADQUARTERS

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NOTES

NOTES

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